CO-PO Attainment Guidelines

ATME

College of Engineering

NBA

Guidelines Book

2019-20

The capacity to learn is a *Gift*;

The ability to learn is a *Skill*;

The willingness to learn is a *Choice*.

-Brian Herbert

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Program Assessment Committee [PAC]
&
Department Advisory Board [DAB]

Program Assessment Committee [PAC]

The Program Assessment Committee (PAC) has been formed for monitoring of different departmental activities. The PAC consists of faculty members of the departments who periodically monitors the Departmental activities and evaluates different parameters.

The Program Assessment Committee shall have general oversight of all issues related to the processes of program review. The committee's duties include, but are not limited to: advising programs undergoing review with regard to the processes, objectives and specific tasks associated with that review; serving as a liaison among the Senate, Academic Affairs, Dean Academics and the programs undergoing review; examining, reviewing, and reporting to the Senate with regard to the progress and outcomes of program review and planning processes; and making recommendations to the Senate regarding the outcomes of these review processes. In pursuit of these duties, the committee may create ad hoc subcommittees.

Objective:

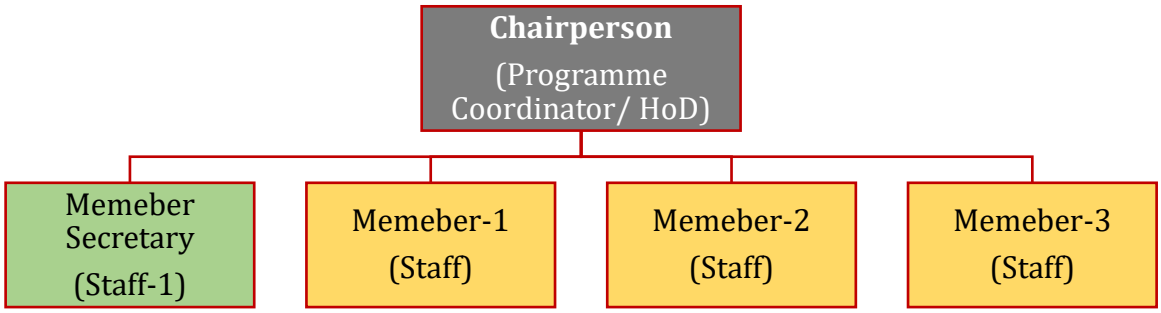
1. To define, review, and implement policies and procedures that help maintain an academic assessment process.
2. To assist academic units with assessment of student learning and development by reviewing the quality and providing feedback on their assessment plans.
3. To Interact with Programme Coordinator, Course Coordinators and outside/community agencies facilitating Program Educational Objectives (PEOs).

Core Function:

The PAC is entrusted with the following responsibilities

- Review submitted assessment plans and reports and recommend revisions as appropriate.
- Monitoring the achievements of Program Outcomes (POs), Program Specific Outcomes (PSOs) and Program Educational Objectives (PEOs).
- Evaluating program effectiveness and proposing necessary changes.
- Preparing periodic reports on program activities, progress, status or other special reports for management.
- Interacting with students facilitating the achievement of POs, PSOs and PEOs.

Structure of PAC:



Frequency of meetings:

- PAC meets at least once in six months to review the programme and submits report to Department Advisory Board.

Department Advisory Board [DAB]

Objective:

The Advisory Committee's purpose is to strengthen the Career and Technical Education programs it serves. The committee exists to advise, assist, support and advocate for career and technical education. It has no legislative, administrative or programmatic authority and is advisory only. Advisory Committees work cooperatively with college officials in planning and carrying out committee work. Members are volunteers appointed by the principal who share an expert knowledge of the career tasks and competency requirements for specific occupations. The committee may serve a specific career and technical education program or a combined committee may serve several programs.

Role of Advisory Committees:

• **Advise –** Advisory Committees assess specific areas of the CTE program. Suggestions are designed to improve specific content areas. Such suggestions could include industry standards, the updating of curriculum, purchase of new instructional materials or equipment to modernize the classroom and to adopt safety policies. Suggestions should be presented in writing to the Administration.

• **Assist –** Advisory Committees help the Instructor or Administrator carry out specific activities. These activities could include judging competitive skills events, setting up a scholarship program or obtaining media coverage for special events.

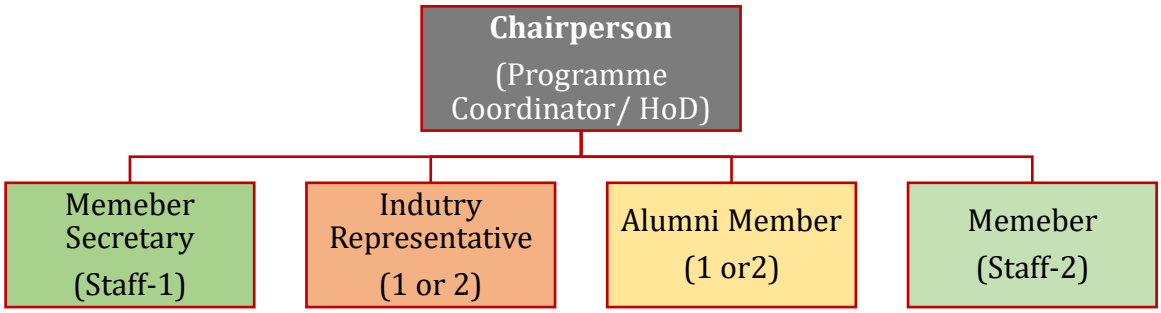
• **Support and Advocate –** Advisory Committees promote CTE programs throughout the community. Promotion or marketing could include identifying industry and community resources, talking to legislators, speaking for career and technical education at board meetings, writing articles for local newspapers or arranging for publicity.

Core Function:

Committee Members have the responsibility to advise, assist, support and advocate for activities designed to strengthen and modernize career and technical education.

- Interact and maintain liaison with key stakeholders.
- Help to determine committee priorities and ways to achieve them.
- Review the attainments of COs and POs
- Review the curricular Gaps obtained and suggest the plans to fill the curricular gaps.
- Verify the various academic activities preparation done by the faculty members for their respective courses.
- Discuss and resolve the issues related to Teaching-Learning Process.
- To submit the report to IQAC on evaluation of attainment of PEOs.

Structure of DAB:



Frequency of meetings:

- DAB meets at least once in a Year to review the programme and submits report to IQAC.

CRITERION 2

Program Curriculum and Teaching –Learning Processes

Process to Identify Curricular Gaps

- In order to identify the curricular gaps, the program must consider course articulation matrix i.e., CO-PO & CO-PSO mapping done by the course coordinator for the current academic year.
- The courses starting from I-year to Final Year need to be consider. In other words, the courses delt by the student under the program need be enlisted in the matrix.
- It is important to note that the Curricular gaps are obtained by considering the courses taught in the respective academic year irrespective their schemes.
- Elective courses need not be considered in the program articulation matrix. (because, Electives for the Even semesters are not able decide in the beginning of the Academic Year)
- A Program Articulation Matrix (PAM) is thus prepared and average values are obtained at the end against each POs and PSOs.
- The average values obtained at the end of the articulation matrix is termed as the direct method values which will be weighted for 80%.
- 20% of the weightage are given to indirect method and the values are considered from surveys.
    - Surveys included for Curricular gap identifications are Employer Survey, Alumni Survey and Program Exit Survey.
    - Please note that, the survey values need to be considered only for POs as there is new PSOs are enlisted in the PAM.
- The target set to identify the curricular gaps are the average of all the PO'S and PSO's.
    - Say if the average value of the PO1 to PO12 and all PSO's are 1.90 then the target for that academic year is 1.90.
    - If the average values of all the POs and PSOs are more than 2, say 2.10, then the target value is set to 2.00
- If the average value of a PO or PSO is below the set target value then the curricular gap exists with respect to that PO or PSO for the current academic year.

SAMPLE: PROGRAM ARTICULATION MATRIX-2019-20

	Course Name	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	New PSO's	
															PSO1	PSO2
I-Year (2018Scheme)	18MAT11	C101.1	3	3	1	2	1	-	1	-	1	1	-	1	-	-
		C101.2	3	1	1	1	1	-	2	-	1	1	1	1	-	-
		C101.3	3	2	1	2	-	-	-	-	-	-	-	2	-	-
		C101.4	3	3	2	2	3	-	-	-	-	-	-	3	-	-
		C101.5	3	1	-	1	1	1	-	-	-	1	-	2	-	-
II-Year (2018 Scheme)	18ME3X	C301.1	3	3	2	2	-	-	-	-	-	-	-	2	3	-
		C301.2	3	3	2	2	-	-	1	-	-	-	-	2	3	-
		C301.3	3	3	2	2	-	-	1	-	-	-	-	2	3	-
	18ME4X															-
III-Year (2017 Scheme)	17ME5X															
	17ME6X															
IV-Year (2015 Scheme)	15ME7X															
	15ME8X															
	AVG		2.58	2.24	1.87	1.68	1.36	1.10	1.02	1.74	1.26	1.14	1.80	1.77	2.33	1.71
	Surveys: Avg (PE+ALU+EMP)															
	Assessment Level (80%PAM+20%Surveys)															
	Target															

Figure 2.1: PAM comprising the COs of all courses with POs and PSOs

Course Name	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
AVG		2.58	2.24	1.87	1.68	1.36	1.10	1.02	1.74	1.26	1.14	1.80	1.77	2.33	1.71
Surveys: Avg (PE+ALU+EMP)															
Assessment Level (80%PAM+20%Surveys)															
Target															

- Surveys we have taken it from 2018-19 passing out Batch.
- They have given the feedback for old PSO (say PSO1 to PSO4)
- So we have to reject the PSO part from the survey.

Average Values- PAM 2020-21		2.58	2.14	2.00	1.95	2.19	1.83	1.86	1.58	2.32	1.55	1.59	1.87	2.03	2.34
Surveys 2019-20	Graduate	87.3	81	92.7	93	90.7	92.7	85.3	87	92.7	92.33	89	87		
	Employer	80	75	72.6	72.6	67.6	72.6	62.6	70	77.6	75	75	82.6		
	Alumni	86	98	94	86	88	86	92	92	94	92	96	86		
Average Values		84.5	84.7	86.4	83.9	82.1	83.8	80	83	88.1	86.45	86.67	85.2		
Levels		3	3	3	3	3	3	3	3	3	3	3	3		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Curricular Gap-2020-21	2.67	2.32	2.2	2.17	2.35	2.06	2.1	1.87	2.46	1.85	1.87	2.1	2.03	2.34
	2.17													

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Figure 2.2: Table to find the Curricular gaps

Process to Identify Advanced and Slow Learners

Identification of Slow and advanced learners place a vital importance in the present scenario in the teaching learning process. Categorisation of students in to such groups will help the students in performing better in their Academics as well as co-curricular activities.

It's a great challenge for a faculty to categorise students into such groups. In order to ease out the process of identification of a student as an advanced or slow learner, a common process is formulated and adopted across all the departments in the college. The detailed description about the process is as follows,

1. A detailed a spread sheet is prepared by the class teacher as per the given format. The spread sheet contains the previous semester results (cumulative) which will be accumulated to CGPA.
2. The Second part of the Spread Sheet contains the IA-1 result of the students. (cumulative marks obtained which will be reduced to the scale 1-10)
3. The third part of the Spread sheet contains the Class Room Intervention through SRS system. Minimum of two Activities need be considered for the calculation and the cumulative marks is reduced to the scale 1-10.
4. The last part in the spread sheet is about the punctuality of the students in submitting assignments and Records. LCR can used as a reference source for the same. This category weighted in the scale of 1-10.

Rubrics to evaluate the student and grade them in the range of 1-10.

Sl. No	Parameter	Levels	Classifiers
1	Academic Performance: Previous Sem Results (CGPA)	CGPA available in scale 10	University Exam Results
2	Based on performance of 1st Internals	10: Average marks >=90% 9: Average marks >=80% and <90% 8: Average marks >=70% and <80% 7: Average marks >=60% and <70% 6: Average marks >=50% and <60% 5: Average marks <50%	Current IA-1 performance
3	Classroom intervention		SRS
4	Submission of Assignments and practical records	5 to 7: Irregularity 8 to 9: Regular but only minor missing to intime. 10: Regular Intime submission	Class teacher (discussing with subject handling faculties and Lab incharge)

Combining all the four parts as mentioned above, appropriate weightages are given in-order get the final Value which will be in the range of 1-10. The weighted factors for the four parts are as mentioned below,

Parameters	Weightage
Academic Performance in previous Semesters in CGPA	**50%**
First IA performance	**10%**
Classroom Intervention through Students Response System (SRS)	**30%**
In time Submission of Assignments and Practical records of Previous semesters	**10%**

Inference:

<table>
<tr><th>Value</th><th>Classification</th><th>Action Plan</th><th>Documents need to be maintained</th></tr>
<tr><td>≥8</td><td>Advanced Learners</td><td rowspan="2">• Extra Study Materials (Solved Question Paper)
• Motivating to publish papers/ carryout mini projects/ participation in workshop etc.,
• Motivating to take up Competitive exams (JAM/ GATE/CLAT/ GMAT/ CAT/ GRE/ TOEFL/ Civil Services/ State government examinations)
• Attending awareness/ training programs to become an Entrepreneur.</td><td rowspan="2">• Participation Certificates
• Score Cards
• Report</td></tr>
<tr><td>≥5 but≤8</td><td>Average Learner</td></tr>
<tr><td><5</td><td>Slow Learners</td><td>✓ Special Classes
✓ Mentoring/Motivating to do well in Academics.
✓ Extra Assignments
✓ Extra Study Materials (Solved Question Paper)
✓ Peer to Peer Learning</td><td>✓ Circulars
✓ Timetable
✓ Attendance
✓ Progress record
✓ Assignment copies
✓ Links related Study materials shared</td></tr>
</table>

CRITERION 3

Course Outcomes (CO) and Program Outcomes (PO)

Criterion 3, deals with the attainment of Course outcomes (COs), Program outcomes (POs) and Program specific Outcomes (PSOs).

3.1.1 Course Outcomes (COs) (SAR should include course outcomes of one course from each semester of study, however, should be prepared for all courses and made available as evidence, if asked)

Table: B.3.1.1

Course Name:	**Year of Study:**
C202.1	<Statement>
C202.2	<Statement>
C202.3	<Statement>
…..	<Statement>
C202.N	<Statement>

C202 is the second course in second year and '.1' to '.6' are the outcomes of this course.

3.1.2. CO-PO matrices of courses selected in 3.1.1 (six matrices to be mentioned; one per semester from 3rd to 8th semester) (05)

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C202.1												
C202.2												
C202.3												
……												
C202.n												
C301.1												
C301.2												
C301.3												
……												
C301.n												

- C202 is the second course in second year and '.1' to '.6' are the outcomes of this course. C301 is the first course in Third Year and '.1' to '.6' are the outcomes of this course.

3.1.3. Program Level Course-PO Matrix of all Courses INCLUDING First Year Courses (10)

Table B.3.1.3

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C101												
C202												
C303												
…..												
…..												
C40n												

- C101: Average value of corresponding PO of C101 course
- Similarly, for all the courses including first Year need to listed in the above table.

Table B.3.1.4

Course	PSO1	PSO2	PSO3	PSO4
C101				
C202				
C303				
…..				
…..				
C40n				

- C101: Average value of corresponding PSO of C101 course
- Similarly, for all the courses including first Year need to listed in the above table.

3.2. Attainment of Course Outcomes (50)

3.2.1. Describe the Assessment Processes used to Gather the Data upon which the Evaluation of Course Outcome is based (10)

3.2.2. Record the Attainment of Course Outcomes of all Courses with respect to Set Attainment Levels (40)

- In order to obtain the CO attainment of the respective course both direct attainment and Indirect attainments are considered.
- Direct attainment is based on performance of the students in the Internal Assessment and end semester examinations
- Indirect assessment is based on the Feed backs given by the students on the Course outcomes known as **Course Exit Survey** and **Faculty assessment** of each COs by evaluating Students (through Assignments).

  Note:
  - Indirect assessment for CO attainment is carried out from the 2019-20 entry batch to the program. i.e., for programs 2020-21, 3 semester students are evaluated both by Direct and Indirect method.
  - For the earlier batches, the CO attainment is based on only on Direct Assessment. i.e., (IA+SEE performances)

Detail procedure for Obtaining CO attainment:

3.2.2.1: Attainment of Course Outcomes-Direct Method

STEP 1: All the faculties handling the courses will map the student performance in the internal assessment to the **excel sheet** as and when the blue books are valued.

CO-PO-PSO ATTAINMENT TOOL

Note 1: In case a question (Ex: 2d) is not present in QP, keep the column blank.
Note 2: If the student is not attempted a question, leave the cell blank. Do not fill with ZERO.
Note 3: Fill only the cells with ORANGE & AQUA color. Do not alter the cells with other colors.
Note 4: If a question maps to multiple CO's, write them separated by commas. Ex: If a question maps to CO-1 and CO-4, write CO1,4.

Subject: Elements of Mechanical Engineering [15ME15]		IA-I (2019-20)							Faculty Name: Prof. Thejkumar J						
S.No.	USN	PART-A								PART-B						
		1	2	3	4	-	-	-	-	5	6	7	-	-	-	<= Question No.
		CO1	CO1	CO1	CO1	CO	CO	CO	CO	CO2	CO2	CO2	CO	CO	CO	<= CO Mapping
		10	10	10	10	-	-	-	-	10	10	10	-	-	-	<= Max Marks
1	4AD19EC001	9		6	8					9	8					<= IA
2	4AD19EC002	9	10	10						5	10					
3	4AD19EC003		8	9	10					9	10					
4	4AD19EC004		6	8	8						10	8				
5	4AD19EC005	6	6	7	7					9	10					
6	4AD19EC006	10	5		10					7	10					
7	4AD19EC007	10	10		10						10	10				
8	4AD19EC008	10		10	10						10	10				
9	4AD19EC009	10	5		10					10	2					
10	4AD19EC010	4	5	4						10	10					
11	4AD19EC011	8		7	8						10	4				
12	4AD19EC012	10	9		10					10	4					
13	4AD19EC013		5	10	10					10	10	10				
14	4AD19EC014	9		8	9					10	10					

Fig. 3.2.1: Mapping of IA marks in excel sheet

Subject: Elements of Mechanical Engineering [15ME15]					IA-I (2019-20)				Faculty Name: Prof. Thejkumar J							
S.No.	USN	PART-A								PART-B						
		1	2	3	4	-	-	-	-	5	6	7	-	-	-	<= Question No.
		CO1	CO1	CO1	CO1	CO	CO	CO	CO	CO2	CO2	CO2	CO	CO	CO	<= CO Mapping
		10	10	10	10	-	-	-	-	10	10	10	-	-	-	<= Max Marks
No. cleared		99	89	74	87	0	0	0	0	71	108	43	0	0	0	0 ≥40
No. attended		137	119	103	103	0	0	0	0	94	132	59	0	0	0	0 ≥30,<840
%		72.26	74.79	71.84	84.47					75.53	81.82	72.88				0 <30
Course Outcomes		CO1	CO1	CO1	CO1	CO	CO	CO	CO	CO2	CO2	CO2	CO	CO	CO	

% of Contribution of each question to CO's																
	1	2	3	4	-	-	-	-	5	6	7	-	-	-	0	0 to 23
CO1	72.26	74.79	71.84	84.47											0	24 to 32
CO2									75.53	81.82	72.88				0	33 to 40
CO3															0	Absent
CO4															0	Total
CO5															#DIV/0!	Avg.
CO6															#DIV/0!	St. D.
															#DIV/0!	Coe. V.

Fig.3.2.2: Calculation over all CO attainment Question wise

% of Contribution of each question to CO's																
	1	2	3	4	-	-	-	-	5	6	7	-	-	-	0	0 to 23
CO1	72.26	74.79	71.84	84.47											0	24 to 32
CO2									75.53	81.82	72.88				0	33 to 40
CO3															0	Absent
CO4															0	Total
CO5															#DIV/0!	Avg.
CO6															#DIV/0!	St. D.
															#DIV/0!	Coe. V.

% of Attainment	CO1	76	CO2	78	CO3	0	CO4	0	CO5	0	CO6	0	IA1	Actual Average

Fig.3.2.3: Actual Average of COs in the IA-1

STEP 2: All the three IA including the improvement test is listed and the attainment is available as shown in the below figure. Attainment is calculated in the scale of 0 to 3 based on the percentage of Overall CO attainment.

CO attainment %	Attainment Level
<50	**0**
≥50 but <60	**1**
≥60 but <70	**2**
≥70	**3**

% of Attainment	CO1	0	CO2	0	CO3	0	CO4	83	CO5	70	CO6	0	IA3
% of Attainment	CO1	0	CO2	76	CO3	76	CO4	0	CO5	0	CO6	0	IA2
% of Attainment	CO1	76	CO2	78	CO3	0	CO4	0	CO5	0	CO6	0	IA1
AVERAGE		76		77		76		83		70		0	
	CO Attainment through IA												
L1 / L2 / L3	CO1	3	CO2	3	CO3	3	CO4	3	CO5	3	CO6	0	

Fig.3.2.4: Overall attainment of CO through Internal Assessment

STEP 3: Attainment Level in University Examination

Attainment Level 1: 50% students scoring more than 50 % maximum marks in the final examination.
Attainment Level 2: 60% students scoring more than 50 % maximum marks in the final examination.
Attainment Level 3: 70% students scoring more than 50 % maximum marks in the final examination.
Enter the university Examination (SEE) percentage of students scored more than 50% of the maximum marks.

Example: If the maximum marks for the Course is 125, then the target marks is 63.
If the maximum marks for the course is 100, then the target marks is 50.

- The University result once again reduced to the scale 0 to 3.

Above target %	Level
<50	**0**
≥50 but <60	**1**
≥60 but <70	**2**
≥70	**3**

STEP 4: The Direct attainment of the COs is calculated by considering ***30% weightage to Internal Assessment*** and ***70% of the weightage to Sessional End Examination.***

	CO Attainment through IA												
L1 / L2 / L3	CO1	1	CO2	2	CO3	2	CO4	3	CO5	2	CO6	0	% of Stu. scoring above Set Target
	CO Attainment through VTU Exam												68
L1 / L2 / L3	CO1	2	CO2	2	CO3	2	CO4	2	CO5	2	CO6	-	
	Direct CO Attainment												
L1 / L2 / L3	CO1	1.7	CO2	2	CO3	2	CO4	2.3	CO5	2	CO6	-	

Fig. 3.2.5: CO attainment-Direct Method

Note: In case if the percentage of Students Scoring 50% of the maximum marks in the examination is less than target i.e., 50% then the CO attainment through VTU exam becomes ZERO.
In such conditions following methods may be used in order set new target for the current course.

- Say, if the percentage of students scoring more than 50% of the maximum marks in SEE for the current year be 48% then,
  - Consider the previous year result for the same course for at least 2 to 3 Years and find the average percentage of students scoring more than 50% target marks.
  - Take the average of those percentage result and the obtained average value is the target for the current Course.

- Say, for previous three years the percentage of students scoring more than 50% of the maximum marks be, 42%, 45%, 52%. Then the average values be 46%.
- 46% thus obtained is set as a target marks for the current year.
- So, now, students scoring more than 46% of the marks will be considered for attainment process. However, the level targets remain the same. i.e.,
  LEVEL 1: 50% of the students scoring more than 46% of the marks.
  LEVEL 2: 60% of the students scoring more than 46% of the marks.
  LEVEL 3: 70% of the students scoring more than 46% of the marks.

3.2.2.2: Attainment of Course Outcomes-Indirect Attainment

CO attainment is also need to be calculated through Indirect assessment. The Indirect assessment is calculated in two Phases.

Phase1: Faculty Assessment of each COs Statements by Evaluating Students (Assignments).

Phase2: By considering the student feedback on Course COs through Course Exit Survey.

Phase1: Faculty Assessment of each COs Statements by Evaluating Students (Assignments).

- In this phase Faculty will evaluate the student through providing assignment or making the students to carry out mini-project works in groups or fabricating working models or conducting quiz or other related exercises and later evaluating the student work and mapping them against the CO related.
- The faculty should take care such that the activities planned are in line with the course.
- The Activities are evaluated according to the marks specified while giving the activities but the scores are mapped against each COs by reducing it into Levels1 to 3.
- In order reduce the scores to Level 1 to 3, faculty may develop a rubric for the same. Each student needs to be evaluated based on the same rubric.

- Specimen rubrics is given in the below figure. However, the course coordinator may develop the rubric according to TLP and assessment used in the course.

Department of Mechanical Engineering

Rubrics for Assessment of each COs [18ME15/25] Statements by Evaluating Students

Course Outcomes	LEVEL 3 Marks obtained is between 8-10	LEVEL 2 Marks obtained is between 5-7	LEVEL 1 Marks obtained is >5
C113.1: Identify different sources of energy, their conversion process and also describe the basic concepts thermodynamics and solving simple numerical problems on steam.	• Clearly identify and differentiate between the different kind of energy sources. • Clearly describe the thermodynamic concepts and solve the numerical correctly.	• Can able to identify and differentiate between the different kind of energy sources moderately. • Can able to describe the thermodynamic concepts and solve the numerical adequately.	• Can identify and but fail to differentiate between the different kind of energy sources. • Can't able to describe the thermodynamic concepts and solve the numerical correctly
C113.2: Explain the working principle of steam boilers, hydraulic Turbines & pumps.	Clearly describes the working principles of boilers, hydraulic turbines & Pumps.	Can able to describes the working principles of boilers, hydraulic turbines & Pumps satisfactorily.	Cannot able to describes the working principles of boilers, hydraulic turbines & Pumps effectively.
C113.3: Demonstrate the working principles of an I.C Engine, Refrigeration, air conditioning and also calculate the performance parameters of an I. C engine.	• Clearly describe the working of IC engines, Refrigeration & Air conditioning Systems. • Can able to solve completely the numerical on characteristics of an IC Engine.	• Can able to describe the working of IC engines, Refrigeration & Air conditioning Systems satisfactorily. • Can able to solve numerical on few characteristics of an IC Engine.	• Cannot able to describe the working of IC engines, Refrigeration & Air conditioning Systems satisfactorily. • Couldn't able to solve numerical on characteristics of an IC Engine.

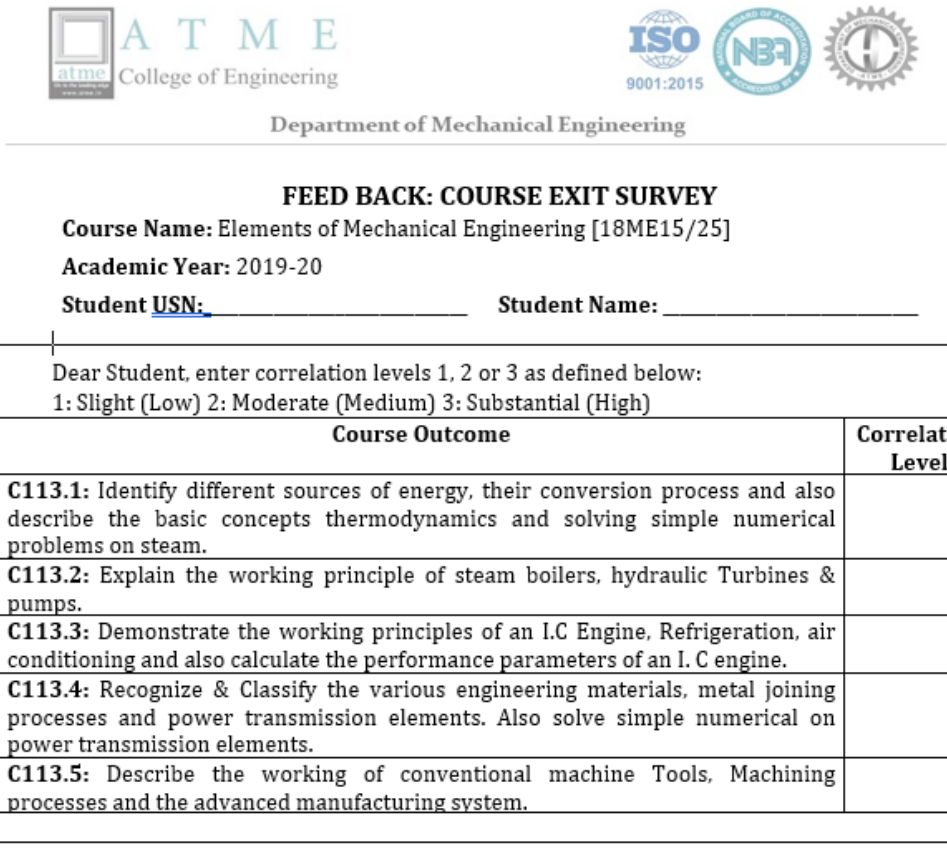
Fig: 3.2.7: Rubrics to evaluate CO's

Table 3.2.2: Faculty Assessment of each COs Statements by Evaluating Students

Sl. No	USN	Name of the student	Assignement-1		Assignement-2		
			Q.1	**Q.2**	**Q.1**	**Q.2**	**Q.3**
			C113.1 (CO1)	**C113.2 (CO2)**	**C113.3 (CO3)**	**C113.4 (CO4)**	**C113.5 (CO5)**
1	4AD19ME001	S1	2	3	2	1	3
2	4AD19ME002	S2	2	1	3	2	2
3	4AD19ME003	S3	1	2	2	1	3
--	--	--	--	--	--	--	--
n	4AD19ME---	Sn	3	1	2	3	2
TOTAL			260	240	285	243	263
Average= Total/ Total No. of Students			2.17	2.0	2.38	2.03	2.19

Phase2: By considering the student feedback on Course COs through Course Exit Survey.

- In this phase a faculty will receive a feedback on COs at the end of the course (End of semester). Student will rate each COs in the scale of 1 to 3 based on his understanding level on the course taught.
  Enter correlation levels 1, 2 or 3 as defined below:
  1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)



ATME College of Engineering

Department of Mechanical Engineering

FEED BACK: COURSE EXIT SURVEY

Course Name: Elements of Mechanical Engineering [18ME15/25]

Academic Year: 2019-20

Student USN: _____ **Student Name:** _____

Dear Student, enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Course Outcome	Correlation Level
C113.1: Identify different sources of energy, their conversion process and also describe the basic concepts thermodynamics and solving simple numerical problems on steam.	
C113.2: Explain the working principle of steam boilers, hydraulic Turbines & pumps.	
C113.3: Demonstrate the working principles of an I.C Engine, Refrigeration, air conditioning and also calculate the performance parameters of an I. C engine.	
C113.4: Recognize & Classify the various engineering materials, metal joining processes and power transmission elements. Also solve simple numerical on power transmission elements.	
C113.5: Describe the working of conventional machine Tools, Machining processes and the advanced manufacturing system.	

Fig.3.2.6: Course Exit Survey Format

- *Faculty will summarise the feedback thus collected in a metrics in excel sheet. The* template of the same is as shown in below figure.

Table 3.2.1: CO assessment through Student feedback on COs

Sl. No	USN	Name of the student	Response on COs				
			CO1	**CO2**	**CO3**	**CO4**	**CO5**
1	4AD19ME001	S1	2	3	2	1	2
2	4AD19ME002	S2	2	3	3	2	2
3	4AD19ME003	S3	2	2	2	2	3
--	--	--	--	--	--	--	--
n	4AD19ME---	Sn	3	3	2	2	3
TOTAL			252	260	240	225	248
Average= Total/ Total No. of Students			2.1	2.17	2	1.88	2.07

3.2.2.3: Overall CO Attainment:

Overall CO attainment is calculated by considering Direct CO attainment (IA+SEE) and Indirect CO attainment (Student feedback and Assessment of COs through Assignments).

- Direct CO attainment is weighted to 70% and Indirect CO attainment is weighted for 30%.
- In indirect CO attainment, 20% weightage is given for Faculty assessment of COs by evaluating Student assignments and 10% weightage is given for course exit survey.

Section		Indirect CO attainment: Faculty Assessment of each COs Statements by Evaluating Students											
A	L1 / L2 / L3	CO1	2.02	CO2	1.79	CO3	2.19	CO4	1.93	CO5	2.81	CO6	
B	L1 / L2 / L3	CO1	1.8	CO2	2.1	CO3	2.18	CO4	1.8	CO5	1.98	CO6	
C	L1 / L2 / L3	CO1	2.5	CO2	2.4	CO3	2.3	CO4	2.2	CO5	2.1	CO6	
	Average	CO1	2.11	CO2	2.10	CO3	2.22	CO4	1.98	CO5	2.30	CO6	-

Fig.3.2.7: indirect CO Attainment through Faculty assessment of each COs by Evaluating Students

	Indirect CO attainment: student feedback on Course COs through Course Exit Survey											
L1 / L2 / L3	CO1	2.48	CO2	2.52	CO3	2.51	CO4	2.43	CO5	2.46	CO6	

Fig.3.2.8: indirect CO Attainment through Student Feedback on COs trough Course Exit Survey

	Overall CO attainment											
L1 / L2 / L3	CO1	1.86	CO2	2.08	CO3	2.1	CO4	2.25	CO5	2.11		-

Fig.3.2.9: Overall CO attainment

- The values thus obtained are the COs attainment for the course for the current Year.

3.2.2.4 Setting Target & Gap Analysis:

- The CO attainments are compared with targets for the gap analysis.
- Targets for CO attainments from academic year 2019-20 onwards are drawn from the averages of COs attainment of previous year i.e., 2018-19.
- The maximum sealing limit of target for any course is set to 2.0. This can be better understood with the following example.
    - Consider an example as shown below,

CASE-I:

Course: C113	C113.1	C113.2	C113.3	C113.4	
AY:2019-20 (Current)	2.0	2.12	2.32	2.25	-
AY:2018-19 (Previous Year)	2.1	2.2	2.4	2.2	**Avg: 2.23**

In the above case, target for the course in current AY:2019-20 is **2**, because the average of attainment of previous AY:2018-19 is exceeding the sealing limit, i.e., 2.23

- Now this target value 2 is compared against COs of the current AY:2019-20 for gap analysis.

Course Outcome	Target for AY:19-20 (a)	Attainment level for AY:19-20 (b)	Gap (b-a)	Gap Analysis
C113.1	2.00	2.0	0	**All COs are attained**
C113.2		2.12	0.12	
C113.3		2.32	0.32	
C113.4		2.25	0.25	

- If the CO attainment is above the target then, the COs for the current course is achieved.
- If targets are not achieved the program should put in place an action plan to attain the target in subsequent years.

Case-II:

Course: C113	C113.1	C113.2	C113.3	C113.4	
AY:2019-20 (Current)	2.0	2.12	2.32	2.25	-
AY:2018-19 (Previous Year)	1.82	1.90	2.00	1.75	**Avg: 1.88**

In this case, the target for the course in current AY:2019-20 is **1.88~1.9**, because the average of attainment of previous AY:2018-19 is less than the sealing limit 2.

- Now this target value 1.9 is compared against COs of the current AY:2019-20 for gap analysis.

Course Outcome	Target for AY:19-20 (a)	Attainment level for AY:19-20 (b)	Gap (b-a)	Gap Analysis
C113.1	1.90	2.0	0.1	**All COs are attained**
C113.2		2.12	0.22	
C113.3		2.32	0.42	
C113.4		2.25	0.35	

- Since all the COs attainments are greater than the target, the COs of the current course is achieved.

Case-III:

Course: C113	C113.1	C113.2	C113.3	C113.4	
AY:2019-20 (Current)	1.82	1.98	2.05	1.60	-
AY:2018-19 (Previous Year)	1.90	1.95	2.05	1.90	**Avg: 1.95**

In this case, the target for the course in current AY:2019-20 is **1.95**, because the average of attainment of previous AY:2018-19 is less than the sealing limit 2.

- Now this target value 1.95 is compared against COs of the current AY:2019-20 for gap analysis.

Course Outcome	Target for AY:19-20 (a)	Attainment level for AY:19-20 (b)	Gap (b-a)	Gap Analysis
C113.1	1.95	1.82	-0.13	**CO1 and CO4 is not Achieved**
C113.2		1.95	0.00	
C113.3		2.05	0.1	
C113.4		1.60	-0.35	

- Since the CO1 and CO4 couldn't meet the target value, the CO1 and CO4 is not achieved.
- If targets are not achieved the program should put in place an ***action plan*** to attain the target in subsequent years.

Case-IV:

- If the Course is new then, the target for the course COs is set at level 1.8. (60% of 3).

Course: C113	C113.1	C113.2	C113.3	C113.4	
AY:2019-20 (Current)	1.82	1.98	2.05	1.60	-
Target	1.8	1.8	1.8	1.8	

Course Outcome	Target for AY:19-20 (a)	Attainment level for AY:19-20 (b)	Gap (b-a)	Gap Analysis
C113.1	1.8	1.82	0.02	**CO4 is not Achieved**
C113.2		1.95	0.15	
C113.3		2.05	0.25	
C113.4		1.60	-0.20	

- If targets are not achieved the program should put in place an ***action plan*** to attain the target in subsequent years.

Note: Similar process is carried out for Laboratory courses.

- CIE is carried out and maintained in Lab Conduction Record (LCR).
- Internal Assessment is carried out and that can be reduced to suitable scale according to the course.
- LCR and IA marks combined together with suitable weightages is turned into Final IA.
- The Overall CO attainment is Carried out by considering 70% of the weightage to the student performance in SEE above the set target and 30% of the weightage to Internal evaluation.

3.3. Attainment of Program Outcomes and Program Specific Outcomes (50)

3.3.1. Describe Assessment Tools and Processes Used for Measuring the Attainment of each of the Program Outcomes and Program Specific Outcomes (10)

3.3.2. Provide Results of Evaluation of each PO & PSO (40)

Program shall set Program Outcome attainment levels for all POs & PSOs.
(The attainment levels by direct (student performance) and indirect (surveys) are to be presented through Program level Course – PO & PSO matrix as indicated).

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C101												
C102												

C409												
Direct attainment												
Indirect Attainment												
Over all PO attainment												

Note: Similar table is to be prepared for PSOs

C101, C102 are indicative courses in the first year. Similarly, C409 is final year course. First numeric digit indicates year of study and remaining two digits indicate course nos. in the respective year of study.

- Direct attainment level of a PO & PSO is determined by taking average across all courses addressing that PO and/or PSO. Fractional numbers may be used up to two decimal places.
- Indirect attainment level of PO & PSO is determined based on the student exit surveys, employer surveys and Alumni survey.

3.3.2.1: Calculation of PO attainment (Till 2018-19 admission Batch):

Following are the steps need to be followed to obtain the PO attainment.

Step 1: Course coordinator should enter the Course articulation matrix as per the course module in the CO-PO-PSO assessment tool.

	CO - PO - PSO Mapping																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2	PSO3	PSO4
C105.1	3	-	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-
C105.2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C105.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C105.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C105.5	2	-	-	-	3	-	-	-	-	-	-	2	-	-	-	-	-
													-				
Course-PO-PSO	2.4	2	X	X	3	X	2	X	X	X	X	2	X	X	X	X	X

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Fig.3.3.1: Course articulation matrix of the respective Course

Step 2: CO attainment from the Internal assessment (in terms of percentage) is multiplied with the Course articulation matrix (CAM) and CAM is expressed in percentage in the subsequent table. Later based on the target level set the percentage of attainment of CAM is expressed in the level points 1 to 3.

	CO - PO - PSO Mapping																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2	PSO3	PSO4
C112.1	3	-	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-
C112.2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C112.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C112.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C112.5	2	-	-	-	3	-	-	-	-	-	-	2	-	-	-	-	-
													-				
Course-PO-PSO	2.4	2	X	X	3	X	2	X	X	X	X	2	X	X	X	X	X

CO Attainment		
COs	%	L1/L2/L3
C112.1	100	3.00
C112.2	91	3.00
C112.3	94	3.00
C112.4	99	3.00
C112.5	97	3.00

	PO & PSO Attainment																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2	PSO3	PSO4
C112.1	100	-	-	-	-	-	67	-	-	-	-	67	-	-	-	-	-
C112.2	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C112.3	94	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C112.4	66	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C112.5	65	-	-	-	97	-	-	-	-	-	-	65	-	-	-	-	-
													-				
% Attainment	77	64	0	0	97	0	67	0	0	0	0	66	-	0	0	0	0

	Attainment through IA																
L1 / L2 / L3	3	2	X	X	3	X	2	X	X	X	X	2	-	X	X	X	X

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Fig.3.3.2: PO-PSO attainment through IA

Step 3: PO attainment through University Examination results is also considered and reduced to level points 1 to 3 as per the target level set.

Step 4: PO and PSO attainment through ***direct assessment*** is thus calculated by putting the weightage 70% to attainment through University Exams and 30% to attainment through IA.

	Attainment through IA																
L1 / L2 / L3	3	2	X	X	3	X	2	X	X	X	X	2	-	X	X	X	X
	Attainment through VTU Exam																
L1 / L2 / L3	3	3	X	X	3	X	3	X	X	X	X	3	X	X	X	X	X
	PO & PSO Attainment - Direct Assessment																
70% weightage	3	2.7	X	X	3	X	2.7	X	X	X	X	2.7	X	X	X	X	X

Direct =70 % of VTU Exam +30% of IA

Fig.3.3.3: PO-PSO attainment: Direct Assessment

Step 5: Indirect Assessment of PO and PSO is calculated by considering the surveys such as Alumni Survey, Program Exit Survey and Employer Survey. The surveys will be taken at the end of the program. (i.e., end of 8th semester).

- In each survey the average values of individual POs and PSOs of the program are taken.
- Then the overall average of POs and PSOs are taken and is converted in to percentage.

Step 6: Above step is carried out for all the three surveys and the final average value of the percentage obtained is converted to Level 1 to 3, as shown below.

PO & PSO Attainment - Indirect Assessment

2019-20 Passed out Batch	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Program Exit Survey	87.33	81.00	92.67	93.00	90.67	92.67	85.33	87.00	92.67	92.33	89.00	87.00	90.67	93.00	89.00	95.33
Alumni Survey	86.00	98.00	94.00	86.00	88.00	86.00	92.00	92.00	94.00	92.00	96.00	86.00	90.00	95.00	92.50	95.00
Employer Survey	80.00	75.00	72.60	72.60	67.60	72.60	62.60	70.00	77.60	75.00	75.00	82.60	84.50	68.75	78.25	81.25
Average Values	84.45	84.67	86.43	83.87	82.09	83.76	79.98	83.00	88.09	86.45	86.67	85.20	88.39	85.59	86.59	90.53
Levels	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Fig.3.3.4: PO-PSO attainment through Indirect Assessment

Step 7: Overall attainment of PO and PSO is obtained by considering Direct and Indirect assessment with the weightage of 70% and 30% respectively.

- The direct attainment of POs and PSOs are obtained separately by listing out all the Course attainments of POs and PSOs (direct attainment) in the program.
- The indirect attainment of POs and PSOs are obtained through surveys as mentioned in the Step 6 for the Program.

Overall PO and PSO Attainment

2019-20 Passed out Batch	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Direct Attainment	2.39	2.22	2.11	2.02	2.16	1.98	1.96	1.91	2.05	2.02	1.94	2.08	2.33	2.16	2.23	1.96
Indirect Attainment	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Overall Attainment (70% Direct+ 30%Indirect)	2.57	2.45	2.37	2.32	2.41	2.28	2.27	2.24	2.33	2.31	2.26	2.36	2.53	2.41	2.46	2.28

Fig.3.3.5: Overall PO-PSO and attainment

Sample Calculation:

Overall **PO1** attainment = 0.7XDirect Assessment + 0.3XIndirect Assessment

= 0.7X2.39+0.3X3

= 2.57

3.3.2.1: Calculation of PO attainment (from 2019-20 admission Batch onwards):

Following are the steps need to be followed to obtain the PO attainment.

Step 1: Course coordinator should enter the Course articulation matrix as per the course module in the CO-PO-PSO assessment tool.

	CO - PO - PSO Mapping																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2	PSO3	PSO4
C105.1	3	-	-	-	-	-	2	-	-	-	-	2	-	-	-	-	-
C105.2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C105.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C105.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C105.5	2	-	-	-	3	-	-	-	-	-	-	2	-	-	-	-	-
													-				
Course-PO-PSO	2.4	2	X	X	3	X	2	X	X	X	X	2	X	X	X	X	X

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Fig.3.3.6: Course articulation matrix of the respective Course

Step 2: Direct CO attainment (in levels) is multiplied with the Course articulation matrix (CAM) and the average level points are reflected in the subsequent table.

	CO - PO - PSO Mapping																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2		
C112.1	3	-	-	-	-	-	2	-	-	-	-	2	-	-	-		
C112.2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
C112.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-		
C112.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-		
C112.5	2	-	-	-	3	-	-	-	-	-	-	2	-	-	-		
													-				
Course-PO-PSO	2.4	2	-	-	3	-	2	-	-	-	-	2	-	-	-	-	-

CO Attainment	
COs	L1/L2/L3
C112.1	1.86
C112.2	2.08
C112.3	2.10
C112.4	2.25
C112.5	2.11

CO Attainment = 70 % of Direct + 30 % of Indirect

PO & PSO Attainment																	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2		
C112.1	2	-	-	-	-	-	1	-	-	-	-	1	-	-	-		
C112.2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
C112.3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-		
C112.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-		
C112.5	1	-	-	-	2	-	-	-	-	-	-	1	-	-	-		
	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0		
% Attainment	1.65	1.45	-	-	2.11	-	1.24	-	-	-	-	1.32	-	-	-		

Attainments	IA	UNV.
L1	>=50%	>=50%
L2	>=60%	>=60%
L3	>=70%	>=70%

Fig.3.3.7: PO-PSO direct attainment

Step 3: PO and PSO attainment through ***direct assessment*** is thus calculated and will be taken for overall PO-PSO assessment.

PO & PSO Attainment - Direct Assessment														
1.65	1.45	-	-	2.11	-	1.24	-	-	-	-	1.32	-	-	-
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	-	PSO1	PSO2

Fig.3.3.8: PO-PSO attainment: Direct Assessment

Step 5: Indirect Assessment of PO and PSO is calculated by considering the surveys such as Alumni Survey, Program Exit Survey and Employer Survey. The surveys will be taken at the end of the program. (i.e., end of 8th semester).

- In each survey the average values of individual POs and PSOs of the program are taken.
- Then the overall average of POs and PSOs are taken and is converted in to percentage.

Step 6: Above step is carried out for all the three surveys and the final average value of the percentage obtained is converted to Level 1 to 3, as shown below.

PO & PSO Attainment - Indirect Assessment

2019-20 Passed out Batch	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Program Exit Survey	87.33	81.00	92.67	93.00	90.67	92.67	85.33	87.00	92.67	92.33	89.00	87.00	90.67	93.00	89.00	95.33
Alumni Survey	86.00	98.00	94.00	86.00	88.00	86.00	92.00	92.00	94.00	92.00	96.00	86.00	90.00	95.00	92.50	95.00
Employer Survey	80.00	75.00	72.60	72.60	67.60	72.60	62.60	70.00	77.60	75.00	75.00	82.60	84.50	68.75	78.25	81.25
Average Values	84.45	84.67	86.43	83.87	82.09	83.76	79.98	83.00	88.09	86.45	86.67	85.20	88.39	85.59	86.59	90.53
Levels	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Fig.3.3.9: PO-PSO attainment through Indirect Assessment

Step 7: Overall attainment of PO and PSO is obtained by considering Direct and Indirect assessment with the weightage of 70% and 30% respectively.

- The direct attainment of POs and PSOs are obtained separately by listing out all the Course attainments of POs and PSOs (direct attainment) in the program.
- The indirect attainment of POs and PSOs are obtained through surveys as mentioned in the Step 6 for the Program.

Overall PO and PSO Attainment

2019-20 Passed out Batch	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
Direct Attainment	2.39	2.22	2.11	2.02	2.16	1.98	1.96	1.91	2.05	2.02	1.94	2.08	2.33	2.16	2.23	1.96
Indirect Attainment	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Overall Attainment (70% Direct+ 30%Indirect)	2.57	2.45	2.37	2.32	2.41	2.28	2.27	2.24	2.33	2.31	2.26	2.36	2.53	2.41	2.46	2.28

Fig.3.3.10: Overall PO-PSO and attainment

Sample Calculation:

Overall **PO1** attainment = 0.7XDirect Assessment + 0.3XIndirect Assessment

= 0.7X2.39+0.3X3

= 2.57

3.3.2.2: Setting Target for POs and PSOs attainments:

- The target for outgoing batch is set with an increment of 0.05 i.e., approximately 2% of max value of attainment level 3 to the previous year set target.
  (Ex: If set target for the 2018-19 outgoing batch is 1.95, then the target to be set for the 2019-20 outgoing batch is 2.0.)
- If the POs & PSOs which have attained the above target, then the new target for the next outgoing batches is to be set with an increment of 0.05.
  (Ex: Target will be 2.05 for 2020-21 outgoing batch and so on.)
- If the POs & PSOs which are not achieved the set target, then the target will remain same for the next batch also.
  (Ex: Target to be set as 2.0 for 2020-21 outgoing batch also if not achieved.)
- If the set target is not achieved for next three consecutive batches, then the target has to be revised with appropriate justification.

Hyperlinks for the Assessment tools are available in below G-Drive:

https://drive.google.com/drive/folders/1khN-fzrQ3QdgcZ8Vy2sBDH4IUmXxNh44?usp=sharing